written in capital letters) is an indispensable part of the apparatus of scientific education. On glancing over those names that are incorporated in the body of the text or attached to important illustrations, one cannot but remark how very English the experimental side of physiology has become.

Breadth of outlook, to which the author lays some claim in his preface, has been secured not in every case by new and suggestive presentation of the materials to hand. Often enough, the author has depended rather on weight of added fact to illumine the intelligence of his readers. The consequence is that while he possesses a clear style that states scientific fact and argument without prolixity or ambiguity, his book makes at the best hard reading, its perusal being calculated to inspire respect rather than enthusiasm for the subject. Its obvious merits, however, outweigh all its defects.

Textual errors and other discrepancies are present in not too great abundance. While no serious blunder of this kind has caught the eye of the reviewer, he *would* venture to protest against the retention of the Egyptian-like perspective of fig. 60.

BRITISH BOTANISTS.

Makers of British Botany: a Collection of Biographies by Living Botanists. Edited by F. W. Oliver. Pp. iv + 332 + xxvi plates. (Cambridge University Press, 1913.) Price 9*s.* net.

THE decision to publish the course of lectures on British botanists given at London University in 1911 was a very wise one, and Prof. F. W. Oliver deserves our sincere thanks for the trouble he has taken to produce so excellent a result. The volume is full of interest, and contains much concerning the lives and activities of some of the lesser-known British botanists that might otherwise have passed into oblivion.

Modern botanists, after the perusal of the several biographies, may well reflect not only when they consider the remarkable energy of their distinguished predecessors, but also when they realise, as they now can, how great were the advances made in botanical science, despite innumerable difficulties, by the pioneers of the subject.

The ten lectures of the course deal with the work of the following botanists: (1) Morrison (1620–83) and Ray (1627–1705); (2) Grew (1641–1712); (3) Hales (1677–1761); (4) Brown (1773–1858); (5) Sir W. Hooker (1785–1865); (6) Henslow (1796–1861); (7) W. Griffith (1810–45); (8) Henfrey (1819–59); (9) Harvey (1811–66); and (10) Williamson (1816–95).

Since these biographies did not, of course, include all the distinguished botanists to whose labours we owe the foundation of botanical science in this country, it was wisely decided to supplement the lectures by the inclusion of chapters dealing with certain other botanists equally deserving of recognition as founders of the science. Even with the inclusion of these worthies, namely, Hill (1716–75), Lindley (1799–1865), Berkeley (1803–89), Gilbert (1817–1901), Marshall Ward (1854–1905), the Edinburgh professors (1670–1887), and especially J. H. Balfour and Sir Joseph Hooker (1817–1911), the list is incomplete. Bentham, for instance, is an unfortunate omission, and it is to be hoped that it may not be long before a second edition is called for and that Prof. Oliver may carry out his intention of adding accounts of several other British botanists who should never be excluded from a historical account of botany in Britain.

Where the general level is so high, it is perhaps invidious to single out individual essays for special commendation, but of the lectures, Hales by Sir Francis Darwin and the account of Robert Brown by Prof. Farmer are of particular interest. The value of the volume is also very much enhanced by Sir W. T. Thiselton-Dyer's masterly account of Marshall Ward and by Prof. Bower's life of Sir Joseph Hooker, a task from its magnitude perhaps harder than that which fell to any other contributor to the volume.

One of the chief reasons why we are grateful for this book is not so much that it tells us once more about men whose names are as household words, but rather because the value of the work done by those whose contributions to the science have been known only to the few can now be seen in its true light by all. Until the appearance of the book, how few of the younger botanists could have given a coherent account of the work of William Griffith, Henfrey, or Harvey?

Griffith, as Prof. Lang points out, was a great botanist:

"It is true that he failed to break through the limitations of his time and period, that he left no new and more correct general views to modify the science. But this is true of all his contemporaries; indeed, it is true of most botanists. To recreate the department of a science in which a man labours requires a combination of ability and fortunate chances that is given to few."

It is especially fitting to remember Griffith at the present day since he was a pioneer in the line of botanical work now known as ecology. Not only did he collect plants, but he frequently adopted the "plan of roughly mapping each day's route and indicating the plants and associations of plants along the line of march." Ecological methods, it should be remembered, were also prominent in the teaching of John Hutton Balfour.

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Many passages of particular interest might be quoted from all of the chapters, but as the book to be appreciated must be read as a whole, we would rather commend it warmly to students of natural history and to those who would know of Britain's worthies. Thanks to the diaries kept by our earliest botanists and from the free use of contemporary information, the biographies are full of living personal interest. We can picture Robert Brown—facile botanicorum princeps, Britanniæ gloria et ornamentum—all the more easily and truly from the human touches in the following extracts from his diary for two consecutive days:

"Feb. 7.—Before breakfast began the German auxiliary verbs. . . . At dinner about 3 pints of port . . . slept in my chair till nearly 3 in the morning.

"Feb. 8.—Before breakfast finished the auxiliary verb *Seyn*; to be. . . ." A. W. H.

PRACTICAL AND THEORETICAL PHYSICS.

(1) *The Essentials of Physics.* By Prof. G. A. Hill. Pp. viii+346. (New York and London: Ginn and Co., n.d.) Price 5*s*.

(2) *Practical Measurements in Radio activity.* By Dr. W. Makower and Dr. H. Geiger. Pp ix+151. (London: Longmans, Green and Co., 1912.) Price 5*s*. net.

(3) *A Systematic Course of Practical Science for Secondary and other Schools.* By A. W. Mason. Book I., Introductory Physical Measurements. Pp. vii+126. (London: Rivingtons, 1912.) Price 1*s*. 6*d*. net.

(4) *Practical Physics: a Text-book for Technical Schools and Colleges.* By Angus McLean. Pp. xi+402. (London: Adam and Charles Black, 1912.) Price 7*s*. 6*d*. net.

(5) *A Course of Elementary Practical Physics.* By H. V. S. Shorter. Part i., Mensuration, Mechanics, Hydrostatics. Pp. 111. Price 2*s*. Part ii., Heat and Light. Pp. 216. Price 3*s*. (Oxford: Clarendon Press, 1912.)

(6) *Lehrbuch der Physik für Mediziner und Biologen.* By Dr. Ernst Lecher. Pp. vii+451. (Leipzig and Berlin: B. G. Teubner, 1912.) Price 8 marks.

(7) *An Introduction to Mathematical Physics.* By Dr. R. A. Houstoun. Pp. ix+199. (London: Longmans, Green and Co., 1912.) Price 6*s*. net.

(8) *Die Elektrizität.* By Prof. F. Adami. (Bücher der Naturwissenschaft, herausgegeben von Prof. S. Günther.) 9 und 14 Band. Pp. 126+4 plates+180+12 plates. (Leipzig: Philipp Reclam, jun., n.d.) Price 1.50 marks.

(1) OPINIONS differ as to the best mode of commencing instruction in every branch of knowledge. The correct solution of the problem is of much importance, particularly in physics, in which subject, for some reason, students seem to find more than average difficulty. The author of this book has been convinced by his teaching experience that the most efficient method of presenting the elementary principles is by means of question and answer. His book therefore consists entirely of a long series of questions. To the more difficult of these questions answers are appended; to the easier the student is expected to supply his own answers. The subjects treated are just those usual in an elementary text-book, the greatest stress, however, being laid on mechanics, to which about half the book is devoted.

While not questioning the undoubted value of question and answer in ascertaining the progress of students, it cannot be admitted that these form the function of a text-book. Question and answer should preferably be oral; they should also be mutual as between teacher and student. As a text-book the present volume is comparatively useless, principally on account of the lack of continuity and logical order which the method of presentation involves, but as a book of examples it may prove of considerable value.

(2) The appearance of a book on radio-active measurements is very welcome. That it should come from the laboratory of Prof. Rutherford, and have for its authors two such distinguished workers on radio-activity, practically ensures its general adoption in advanced physical laboratories. It can scarcely be doubted that the authors' assurance that so many and varied exercises in radio-activity can be performed with comparatively small quantities of active material will lead to the introduction of such measurements into the laboratory courses of many honours schools in physics. Most of the experiments described are already so included in Manchester, particularly with the view of the students ultimately taking up original research in this subject.

The earlier part of the book is devoted to the theory and practical use of the electrometer and various electroscopes, and the treatment is both detailed and lucid. Much useful advice in the construction of home-made instruments is given, and the student is also told how to surmount the various difficulties which arise. Chapters iii. to vi. are devoted to the practical exercises previously referred to, the number which can be performed by means of simple apparatus being surprisingly large.

The remainder of the book is intended for original investigators rather than ordinary students. Here the methods of making accurately standard radio-active measurements and the separation of radio-active substances are treated

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